BATTLEFIELD DISTRIBUTION: A Systems Approach?

A Monograph
By
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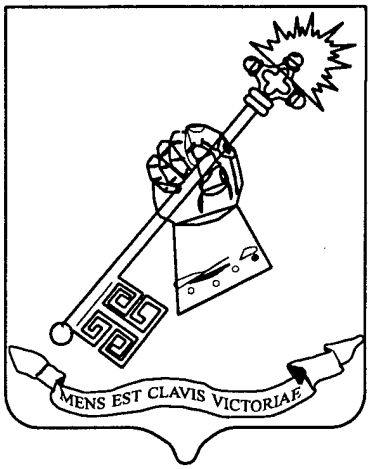
Quartermaster



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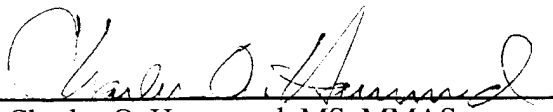

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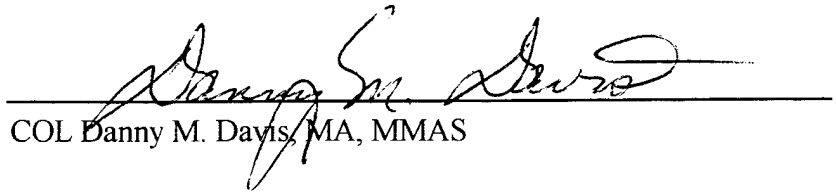

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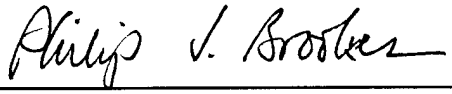

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ABSTRACT

Battlefield Distribution: A Systems Approach? by Major Robin J. Stauffer, USA, 56 pages.

This monograph examines the Battlefield Distribution (BD) concept to determine if it is capable of integrating the six tactical sustainment functions in order to form a more responsive distribution system. The current distribution system is judged to be fragmented along functional lines and slow to respond to user requirements. The BD concept is designed to be a more responsive system by alleviating the deficiencies in the current system. The monograph examines the current and proposed distribution systems and conducts a comparative analysis, using civilian industry models, to determine if the BD concept is a holistic approach and is capable of increasing user confidence.

The monograph begins with a brief historical review of the evolution of the army's distribution system. Then it examines in detail the current distribution system and highlights the functional alignment of the six sustainment functions and their supporting information management systems. The monograph then shows that the lack of system confidence is a function of four problem categories in the current system; structural issues, user behavior, unresponsiveness to change, and low standards. The monograph then turns to describing the BD concept. The monograph describes the centralization and consolidation of distribution management functions and the integration of new information and communications technologies into the proposed distribution system.

In the analysis section the monograph conducts a comparative analysis of the current system, the proposed system, and civilian distribution models. The analysis section defines civilian theory which is successfully being applied to increase efficiencies in industry distribution systems. The monograph concludes that the BD concept is founded on successful civilian industry theory and is a holistic approach toward solving the problems in the current distribution system. The research indicates that the BD concept does have the capability to integrate the six sustainment functions by centralizing management functions and consolidating distribution activities. The monograph also concludes that the BD concept is designed to correct the structural issues and the unresponsiveness to change deficiencies but does not adequately correct the user behavior and low standards problems. The monograph concludes that BD creates a *confidence paradox* by providing a more efficient system which will not be utilized by the rational user in the high friction environment of war. Overcoming rational human behavior is and will always be a formidable challenge for the army distribution system.

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I. Introduction

The purpose of this monograph is to determine if the Battlefield Distribution (BD) concept, as developed by the Combined Arms Support Command (CASCOM), is being developed with a true systems perspective. Subsequent purposes are to educate the reader on an emerging concept and to add to the debate of applying new technologies to logistics concepts.

The monograph will attempt to answer one primary and four subordinate research questions. The primary research question to be answered is: Will the Battlefield Distribution (BD) concept, as developed by the Combined Arms Support Command, be capable of integrating the six tactical sustainment functions to form a more responsive distribution system? The four subordinate research questions are:

Is the BD concept oriented toward solving the identified problems of the current distribution system?

What are the interrelationships of the six tactical sustainment functions (arming, manning, fueling, fixing, moving, and sustaining) required to make BD a true systems solution?

Does information technology provide leverage in the BD system?

Are there successful civilian industry models which support the BD concept?

By answering these question the monograph will determine whether BD will resolve the deficiencies of the current distribution system.

The current distribution system is plagued with numerous problems. Recent studies indicate a low level of customer confidence in the army supply system because it is inefficient and unreliable. This inherent lack of system confidence leads to local "work arounds" which in turn place more burdens on the system. The US Army Combined Arms Support Command's (CASCOM) combat service support battle lab has developed the BD concept in order to remove the inefficiencies and bolster supported unit confidence. The development of the BD concept is a continuation of the army's evolutionary process to make the supply system more efficient and responsive. The concept is centered on the use of information and communication technologies to support structural and procedural changes in the current system.

The BD concept is a component of the larger umbrella concept of Total Asset Visibility and In-transit Visibility (TAV/ITV). The TAV/ITV program is a strategic level program that uses information technology to improve the Department of Defense distribution system. BD focuses on intra-theater distribution from air and sea ports of debarkation (A/SPOD) to the user. BD will have the capability of retaining visibility of requisitions and supplies as they move from the user to the supplier and from the supplier back to the user. BD will use existing and new technologies to increase the "velocity"[1] of management through an increase in information flow and will thus have a direct impact on the order ship time (OST) for supplies. The BD system should be capable of breaking the barriers between the functionally aligned supply subsystems. These "stovepipe" subsystems are oriented along vertical coordination within subsystem versus the horizontal coordination between the subsystems. The BD concept should be capable

of integrating the current "stovepipe" supply subsystems into one system, thereby increasing efficiencies and user confidence.

Previous attempts to improve efficiencies and system confidence have been focused on individual "stovepipes." Each of the six sustainment functions have supporting standard army management information systems (STAMIS's). The BD concept will have the ability to integrate all existing and future "stovepipe" automations, if it is successful.

The methodology for research was based on a systems perspective. The research was accomplished using primary sources located at the Logistics Concepts Directorate, the CSS Battle Lab, and the Force Development and Evaluation Directorate of the Combined Arms Support Command. Primary sources from industry case studies were used where appropriate. Joint, Department of Defense, and Department of the Army regulations and publications, and appropriate military and civilian journals and publications were used as secondary sources to support the research.

The analysis will compare the evolving concept with successful current and evolving distribution concepts in civilian industry. By looking at the deficiencies in the current tactical distribution system and comparing them to the BD the analysis will support or refute the theoretical basis of the BD concept as a holistic approach to solving the current distribution problems.

The scope of research was restricted to the tactical level of war. Specifically, the research was limited to tactical level logistics operations. The research focused on the distribution systems within the corps, division, and brigade organizations.

The monograph is divided into five sections. Section one is the introduction. Section two, the current distribution system, looks at the historical basis of the current system, provides a broad conceptual discussion of the operations of the current tactical distribution system, and highlights some of the deficiencies in the current system. The third section defines the battlefield distribution concept as developed by CASCOM. This section looks at the organizational and technological changes proposed under the BD concept. The monograph's fourth section contains the analysis of the BD concept. This section provides a comparative analysis of the current and proposed systems in relation to successful industry theoretical patterns. The analysis will show whether or not the BD concept is truly a holistic approach. The final section is the recommendations and conclusions. This section will briefly review the salient points of the monograph and provide recommendations for the evolving concept.

II. The Current Distribution System

"The final measure of achievement for logistics accomplishment must be the success with which men and materiel are delivered to the fighting front."[2]

Historical review.

The US Army has been in the business of distribution since the army's inception. The process of maintaining and sustaining the army in the field is rooted in its history. From the depot systems of the Revolutionary War to the forward logistic bases of Desert Storm, the army has relied on distribution systems which have been successful in the high friction and thick fog of war.

General Washington's lines of communication extended from the Head of Elk on the Chesapeake Bay to Saratoga on the Hudson River. In order to support the movements and operations of his armies, Gen Washington established a series of depots within his area of operations. The depots were supported by roads and rivers which allowed for the distribution of supplies and the movement of troops. Stockages were based on forecasted requirements based on troop strength, distance of moves, and rates of march. The stockage philosophy was to store more than was required of food, arms, and munitions. In this manner Gen Washington was assured that unscheduled requirements or disruptions in transportation would not have a significant impact on his operations.[3]

The philosophy of building a distribution system capable of reacting to unforeseen events continued through our history. Gen Winfield Scott, during the Mexican War, though ultimately successful, may have been delayed by "his constant desire for more of everything than really was necessary -- the vice of over-estimating

requirements."[4] Our Civil War, even with advances in transportation and communication technology, saw more of the same type of philosophy.

The Federal Army, with its relative advantage in rail network and industrial capability, relied on a "more-is-better" philosophy. The distribution network of the union forces relied on forward supply depots, rail, inland waterways, and wagons. The supply depots and distribution system were again designed and stocked with more than was eventually needed.[5] The philosophy carried throughout the Civil War and became even more pronounced as the US Army expanded operations around the globe. World Wars I and II and the Korean war were all supported by a distribution system which was based on a "more-is-better" philosophy.

During the Vietnam War the army attempted to change its philosophy. In response to a cry for change Lt. Gen. Joseph Heiser, Jr. introduced his "Logistics Offensive" campaign with the goal of designing a more "effective and efficient" logistics system.[6] At the center of his "offensive" was his "Inventory in Motion" concept. Inventory in motion was a "revitalized supply management program, [which was to] minimize the requirement for large stock levels at immobile depots activities in the combat zone. Integrated supply and transportation planning, real-time assets control of in-transit stocks, and more intensified management will yield rapid resupply response with smaller inventories and with reduced static stocks on the ground."[7] Another significant program within the "offensive" was "Operation STREAMLINE."[8] This program was designed to "eliminate unnecessary stocks and supply echelons, reduce the order ship time, . . . accelerate direct delivery from the United States to the direct-

support-unit (DSU) and general-support-unit (GSU) levels in combat areas, and improve logistics intelligence and asset control (particularly in-transit)."[9] These two programs within the logistics offensive, were designed to improve the system's performance and reduce the stockpiling of supplies. While some of the initiatives of the programs were successfully implemented,[10] an analyses of Operations Desert Shield and Desert Storm show that the army is still relying on a "more-is-better" philosophy.

Throughout the evolution of the army's distribution system the advances in communications and transportation technology were being integrated. However, the philosophy for distribution remained the same. The acknowledgment that friction and fog are constants in war has been the foundation for the design of the army's robust distribution systems throughout its history.

The Current Tactical Distribution System.

To ensure dependable and uninterrupted logistics, the army has echeloned its combat service support system to coincide with the three levels of war; strategic, operational, and tactical. Strategic logistics deals with mobilization, acquisition, projecting forces, strategic mobility, and the strategic concentration of logistics in a theater base and the communications zone. It links the nation's economic base to its military operations in a theater.[11]

Operational logistics focuses on force reception, infrastructure development, distribution, and the management of materiel, personnel, movements, and health services. Operational logistics encompasses those support activities required to sustain campaigns

and major operations. Assured communications supporting high data-transmission rates with the national industrial base provide total asset visibility of critical items. In-transit visibility enables commanders to know where their critical resources are in the "pipeline" and allow them to allocate them based on their projected arrival. Operational logistics is the conduit from strategic to tactical logistics.[12]

Tactical logistics sustains the tactical commander's ability to fight battles and engagements. The focus at the tactical level is on manning and arming tactical units, fixing and fueling their equipment, moving soldiers, equipment, and supplies, and sustaining soldiers and their equipment.[13] The current tactical distribution system is functionally oriented along six sustainment functions.

At the corps level there are three primary activities which coordinate the distribution system; the corps materiel management center (CMMC) and the corps movements control center (CMCC) and the corps support command (COSCOM) support operations section. At the division level the distribution system is managed by the division materiel management center (DMMC) within the division support command (DISCOM), the DISCOM movements control officer (MCO), the DISCOM support operations section, and the division transportation officer (DTO). At the brigade the support battalion support operations officer and the supply, maintenance, and transportation companies conduct the distribution operations. Each of these activities at the tactical level are aligned along six functional areas; manning, arming, fueling, fixing, moving, and sustaining the soldier.

The manning function is focused primarily on personnel replacement operations. Replacements flow directly from the theater-level general support (GS) replacement organizations to divisions. Movement and transportation requirements from GS to division are coordinated by theater army or corps. Corps movement coordination will be accomplished by CMCC, the direct support (DS) replacement company of the personnel group, and the division G1. Within the division the division replacement team coordinates with the G1, G4 and DISCOM transportation officer for movement to the brigade support area (BSA). The goal for moving replacements from the division replacement team to the BSA is 24 hours. The brigade S1 processes and assigns replacements to the battalion. The battalion arranges for movement from the BSA to the battalion.

The distribution of ammunition, fuel, field services, and general supplies (arming, fueling, and a portion of sustaining) is controlled by the corps and division. The flow of supplies through the corps area to the division is based on priorities established by the corps and division commanders. Requirements are passed from the BSA through the DISCOM support operations officer and the DMMC to the COSCOM's MMC, MCC, and support operations officer. The distribution activities such as the corps storage area (CSA), three ammunition supply points (ASP), one ammunition transfer point (ATP), petroleum storage sites, and bulk cargo sites are operated by various elements of COSCOM. The multiple management activities at each echelon maintain visibility of stocks, transportation assets, and requirements in order to facilitate the distribution of supplies to the user.[14]

The distribution system which supports the fixing function is built on a repair forward concept. Repair parts and maintenance capabilities are pushed as far forward in the battle area as feasible. Repair parts stockages and replacements are based on scheduled requirements and historical use. In addition to repair parts flow and stockages, the fixing distribution system supports the evacuation and replacement of major combat systems. Like the arming, fueling, and portions of the sustaining functions the fixing function is controlled by multiple management activities at the various echelons of support.[15]

Corps movement management services are performed by the CMCC. The CMCC consolidates requirements and confirms capabilities from the various movement control teams (MCT) throughout the corps area. The MCTs maintain visibility on the corps transportation capabilities. The COSCOM support operations officer validates the movement priorities for the CMCC. Corps mode and terminal operations are accomplished by various COSCOM transportation units.[16]

The movements management function at the division level is accomplished by the DTO and the DISCOM MCO. The DTO plans and establishes movement priorities based on the commander's mission priorities. The MCO centrally controls division transportation resources and coordinates priorities with the DTO. The MSB transportation and motor transport (TMT) company in the MSB is the primary transportation asset in the division. The MCO retains visibility of the TMT's capabilities and balances the requirements against the capabilities. The MCO will coordinate with

the DTO and supporting corps MCT in cases where the requirement exceeds the capability.[17]

The sustaining function includes five subordinate functions: personnel service support, health services, field services, quality of life, and general supply support. Each sub-function has an impact on the tactical distribution system. However, health services, field services, and general supply support have the greatest impact of the five. Personnel service support shares similar distribution activities with the manning function, which were discussed earlier.[18] Quality of life refers to the command's responsibility to ensure that not only the soldier is cared for but that his immediate family is provided care and assistance during unit deployments.[19] Field services and general supplies distribution were discussed previously.

Health services support (HSS) distribution system consists of patient evacuation and materiel flow. The HSS distribution system uses separate channels than the arming, fixing, fueling, and manning system. The senior medical unit operating in the corps, a medical brigade or medical group, controls and manages patient evacuation from the division area. Corps medical units will provide the necessary transportation for evacuation. The medical materiel distribution is directly commanded and controlled by the medical brigade headquarters. The medical logistics (MEDLOG) battalion (forward) provides medical supply and medical equipment maintenance for corps and division units. The MEDLOG Bn (fwd) coordinates with the CMCC for the shipment of medical supplies to the division medical supply office (DMSO).[20]

The division surgeon, division medical operations center (DMOC), and the division medical supply office (DMSO) all work together to effect the division distribution of patient evacuation and medical materiel flow. Like the corps medical units, the division medical units are responsible for evacuating patients from the next lower echelon of medical support. DISCOM medical units provide ground ambulance transportation for evacuation of patients from forward elements. The medical materiel flow generally follows the patient evacuation flow. The DMOC and DMSO, in coordination with the division surgeon, control the flow of medical supplies and maintenance. The DMSO is the linkage between the DISCOM medical units and the MEDLOG Bn (fwd) for medical supply distribution. The DMSO establishes stock levels and maintenance priorities separate from the DMMC.[21]

In summary, the six tactical sustainment functions distribution systems are managed, controlled, and operated by numerous corps and division activities. The CMMC, DMMC, MEDLOG Bn (fwd), and DMSO maintain visibility of inventory stocks, replenishment of supplies, and evacuation of equipment and patients. The CMCC, DTO, and DISCOM MCO maintain visibility and allocate corps and division transportation assets in support of MMC and GS/DS unit requirements. The COSCOM and DISCOM support operations officer manages the taskings of the various GS/DS units in support of the using units, based on GS/DS capabilities and materiel stocks.

In order to effectively accomplish the necessary coordination of requirements, capabilities, and resource stocks, the various activities must maintain constant

communications. The standard army information management systems (STAMIS) are the backbone to the information piece of the tactical distribution system.

The accomplishment of the three manning functions is supported by the army standard installation/division personnel system (SIDPERS). SIDPERS is designed to support the personnel management functions of strength accounting, organization and personnel record keeping, and personnel management reporting through all command levels. The brigade level SIDPERS units will forward personnel and administrative data to each other, the division personnel support company (PSC), and the corps PSC.[22]

The arming function is supported by the standard army ammunition system (SAAS) STAMIS. Specifically, at the tactical level the arming function is supported by SAAS-level 4 (SAAS-4). SAAS-4 supports daily storage operations which include receiving, storing, inventorying, rewarehousing, shipping, and issuing ammunition. SAAS-4 is the standard system for the management of class V conventional ammunition at the corps storage area (CSA) and ammunition supply points (ASP). The system automates the CSA and ASP records, provides input to the CMMC STAMIS (SAAS level 1/3) and provides management reports to CSA and ASP managers. The SAAS-DAO is the STAMIS which supports the DAO in the routine management and distribution of ammunition in the division, separate brigade, and armored cavalry regiment. SAAS-DAO receives manual reports from the DISCOM ammunition transfer points (ATP) and in the future will have the capability to interface with the unit level logistics system in the S4 section (ULLS-S4).[23]

The ULLS family of STAMIS includes aviation, ground, and S-4 (ULLS-A, ULLS-G, and ULLS-S4). ULLS-A and ULLS-G are a multi-user local area network (LAN) based system. The systems are designed to be operated by unit level personnel in order to manage and perform maintenance management functions (prescribed load list (PLL) management) and receiving and initiating supply and support maintenance data. ULLS-S4 interfaces with ULLS-A&G and various other STAMIS in order to allow the S4 to conduct the requisitioning and distributing of all classes of supply (less class IX), property accountability, and other supply management functions.[24]

The fueling, fixing, and sustaining functions are supported by numerous STAMISs. At the unit level ULLS is the primary STAMIS which interfaces with numerous DSU STAMISs. The DSU receives the ULLS information, processes it through the appropriate STAMIS, and interfaces with numerous MMC STAMISs. The MMC provides the oversight for the information and materiel flow.

At the DSU level the fueling and sustaining function are supported by the standard army retail supply system, level 1-interim (SARSS-1-(I)), the objective supply capability (OSC), and the direct support unit standard supply system (DS4). SARSS-1-(I) is the standard system for receipts, issues, replenishments, and storage operations for storage support activities (SSA) at the DSU. It processes customer unit requests, provides an interactive inquiry capability, and provides asset, demand history, and informational data to the MMC STAMISs, primarily the direct support unit standard supply system (DS4).[25] The DS4 is operated both at the DSU and MMC level. At the DSU level DS4 manages information for supply classes II, III, IV, VII, VIII, and IX.[26]

The OSC was designed to integrate the wholesale and retail supply systems into a single seamless supply system. The OSC provides the same day processing of requests for issue; visibility of all assets within an area; status to users; and lateral distribution of assets. The OSC capabilities will be incorporated with the SARSS-1-(I) and will be replace with the SARSS objective (SARSS-O).[27]

The DSU STAMISs provide fueling and sustaining information to the standard army intermediate level supply system (SAILS), the SARSS-2A and SARSS-2B, and the DS4 STAMISs at the MMCs. These STAMISs maintain visibility of stockage levels, inventory replenishments, and consumption and demand data. The MMCs manage and control the distribution of fueling and sustaining materiel based on the information processed in these STAMISs.[28]

The HSS portion of the sustaining function is supported by the army medical management information system (TAMMIS). TAMMIS supports medical logistics operations by tracking patients and managing medical information of medical units from battalion aid stations through corps medical units.[29]

The fixing function is supported by the standard army maintenance system (SAMS). The SAMS family is used at the DSU, the operations sections of DISCOM units, the DMMC, and the CMMC. The system automates work order requisitions and supply document registers. It automates inventory control and reordering of stocks. It is also used at the MMCs to collect and store equipment performance data in order to determine guidance to be given to subordinate maintenance units.[30]

The move function is supported by the department of the army movements management system-movements planning module (DAMMS-MPM). DAMMS-MPM supports the development and maintenance of war-time movements plans or programs. The DAMMS-revised (DAMMS-R) is system is comprised of seven modules. These modules, when fully developed, will support the CMCC, DTO, and DISCOM MCO management of transportation resources and missions in the division and corps.[31]

Measures of effectiveness.

The current system is measured in terms of days of delivery from time of customer requisition to the time the customer receives the requested item. This cycle is referred to as the order-ship-time (OST). The OST is defined by Uniformed Materiel Movement and Issue Priority System (UMMIPS) as defined in Army Regulation 725-50.

There are many factors which impact on the OST. The force activity designators (FAD), geographic location (CONUS or OCONUS), urgency of need designators (UND), and the priority designator (PD)[32] are used to define the standard of measure for the OST. The current standard delivery dates (SDD)[33] are summarized in Table 1.[34]

Table 1 UMMIPS Standard Delivery Dates

Priority Designator	CONUS and Intra-theater	OCONUS
01 - 03	7 days	11 - 12 days
04 - 08	11 days	15 - 16 days
09 - 15	29 days	67 - 82 days

Problems in the Current System.

The current distribution system is plagued with inefficiencies that directly impact on customer confidence. A recent study by the RAND Corporation has defined four general categories has to why the army's distribution system does not work. The study cites structural issues, user behavior, unresponsiveness to change, and low standards as the reason the system doesn't work and customers are dissatisfied.[35] Lieutenant Colonel Donald Hinton, in his article *A Customer's Perspective on Army Materiel Distribution*, states that the most important problem uncovered by the RAND study "is that customers have a fundamental distrust of the system."[36]

The current distribution system is a complex and fragmented assemblage. The various managers within each echelon of support, the proliferation of automation tools within each functional area, and the "stovepiped" management of information and materiel all add to system inefficiencies. The RAND study concludes that "[t]he distribution structure is a patchwork quilt of functions and responsibilities that optimizes component parts at the expense of system efficiency. It is not an integrated activity."[37] The system structure is fragmented and has no clear focus with regards to customer satisfaction which drives customers to act with "rational behavior."[38]

User behavior, the second problem category, contributes to the system's performance. The delays in the system coupled with the rational actions of the requester duplicate the classic "beer game."[39] The beer game is a simulation of a production/distribution system designed to show how "problems originate in basic ways of thinking and interacting, more than in peculiarities of organization structure and

policy." The simulation traces the reaction and behavior of customers, suppliers, and manufacturers as delays in the system occur. Suppliers will place orders based on customer demands and manufacturers will react by increasing production. However, there are inherent delays in the system which are not obvious to the customers, suppliers, and manufacturers. Therefore, when the system does not produce results as expected the customers, suppliers, and manufacturers act rationally and place greater demand on the system. The simulation produces three lessons which result from rational behavior; structure influences behavior, structure in human systems is subtle, and leverage often comes from new ways of thinking.[40]

The rational behavior of the current system users duplicate the beer game simulation. LTC Hinton sums this behavior when he states "because the process functions poorly, those involved have no confidence in it and take adaptive but entirely rational action to improve performance. For example, when the system responds slowly or when users move or cannot find their requisitions in the system, they resubmit requests, further clogging the system."[41] Due to a lack of confidence in system response, users historically over order to stockpile or continually reorder until receipt of materiel. These behaviors place additional burdens on the system and continue to degrade system performance.

The third area that RAND cites, the system's unresponsiveness to change, refers to the system's inability to realize that changes in operating costs allow for more efficient operations. Transportation costs have decreased while materiel costs have either increased or remained stable.[42] Computing and the storing and retrieving of information

has declined even more rapidly than transportation costs. Additionally, the computing and information technology provide the ability to know what's in the system and where it is located in the system. The study states that "information is a key to efficient distribution."[43] These trends provide the capability for the system to be much more responsive. However, RAND concludes that the army has failed to fully realize these trends. "When a system does not have the visibility of what it contains, efficient management is not possible."[44]

The final deficiency with the current system is its low standards. LTC Hinton provides the appropriate statement, "World-class organizations measure their requisition times in hours, while the Army is still using days as its unit of measurement."[45] RAND also cites the low UMMIPS standards and how the standards have failed to keep pace with the changing environment. "In 1959, the standard for high-priority shipment in the United States was 6 days, and low priority shipments were allowed 20 days."[46] Not only are the standards "unambitious," but they are rarely even met. "An analysis of the pipeline performance showed that only 17 percent of the highest-priority shipments in the United States met the standard." During Operation Desert Storm the system "performed even worse. High-priority shipments took an average of 30 days, or more than three times as long as the standard. The system does not ask for high performance, and it does not even get what it asks."[47]

The underlying current of customer dissatisfaction with the current distribution system is a function of the mistrust of the system. This mistrust is based on a fragmented, unresponsive, low-standard distribution system.

III. The Proposed Distribution System

"Without a firm directing hand providing for the uninterrupted flow of supplies, replacements, and reinforcements a machine-age army will cease to function within a matter of days ..."[48]

The U.S. Army's logistic organizations and processes have been evolving since the army's inception. The purpose of the changes have been to increase the efficiency and responsiveness of providing support to the field forces. The focus of the changes have been on organizations and processes. Like the past, the current changes within the logistics community are focused on gaining efficiencies through the use of new technologies. The current focus is on improving the distribution of materiel from a CONUS sustaining base to the user in a force projection army operating in a theater of operation. The fundamental reason for this current change is the lack of users' confidence in the distribution system.

There are several concepts which are supporting the change in the distribution systems. The Total Distribution Action Plan (TDAP) is the overarching concept for the change. When the TDAP was approved by the Vice Chief of Staff of the Army in May 1992, "the Army made a commitment to finally fix CSS in general, and distribution in particular."[49] BD is one of many CASCOM led initiatives to improve the distribution system. The major initiatives which are being developed in close coordination with BD include the Velocity Management (VM) Initiative, the Support Command of the Army Service Component Command (ASCC), and the Reception, Staging, Onward Movement, and Integration (RSO&I) Initiative.[50] These initiatives are designed to provide visibility

to materiel as it flows through the distribution pipeline and improve information flow within the distribution system thereby increasing the responsiveness to requirements.

BD is an attempt by the army to integrate the current distribution systems into a single system thereby improving system confidence. The intent of BD is to "maximize throughput and ensure continuous and timely visibility of units, personnel, and unit/sustainment materiel moving within the area of operations."[51] CASCOM's intent is to provide the combatant commanders and their supporting activities a "fully integrated (materiel and movement) distribution system."[52]

The BD concept arose as a result of analyses of recent operations. The analyses have shown that there are numerous "deficiencies within the current distribution system because the 'stovepipe' systems of today create resource demands that can no longer be supported."[53] The BD concept is to create efficiencies in the army distribution system as the army continues to down size and transitions to a force projection strategy.

BD is defined as "a holistic system of information exchanges, management procedures, functional designs, and reengineered operational processes which enable U.S. forces to properly request, receive, redirect, track, distribute, control, and retrograde personnel, units, materiel, facilities and services within a single distribution system."[54] The CASCOM PAM continues the definition of BD by stating that it "is a fully integrated distribution management system utilizing state-of-the-art technologies such as communications enhancements, automatic identification technology, automated source data input, integrated information management systems and distribution platforms."[55] BD is an attempt to remove the current distribution's 'stovepipe' subsystems and create a

single efficient distribution system. The five objectives of BD are: "improved combat capability; improved performance in the distribution of materiel, units, and personnel directly to the warfighter; improved command and control integration in supply, maintenance, and transportation; properly sized, configured, and positioned materiel to support the customer; and improved customer confidence."[56] These objectives will be supported by "implementing improvements" in the current system designed to increase customer confidence.[57]

BD will increase system confidence by implementing structural and procedural improvements to the current distribution system. The structural improvements include integrating materiel and movement management, improving command and control between supply and transportation management by designating a distribution manager at each echelon, properly sizing, configuring, and locating materiel to increase the velocity of support to the customer, establishing theater opening force modules to deploy early into the area of operation (AO), utilizing a "hub-and-spoke" distribution system (HSDS), and conducting force closure and Reception, Staging, Onward Movement And Integration (RSO&I) operations.[58]

The process will be improved by satisfying demands from stocks located outside the area of operations and distributed to the requester within 72 hours, satisfying the demand from stocks located within the area of operations and distributed to the requester within 24 hours, increasing the capability for throughput, integrating and managing unit moves with equipment and sustainment moves, using horizontal redistribution of materiel[59], expediting port clearance, providing sustainment materiel to the area of

operations based on the operation tempo (OPTEMPO) and historical demand analysis, and establishing schedules for routine distribution.[60] The success of the structural and procedural changes are dependent on the increased speed of information as a result of the integration of information and communications technologies.

The keystone of the structural changes of Battlefield Distribution operations is centralized management of the distribution systems of the six tactical sustainment functions and the consolidation of distribution functions. The planning and coordinating for the timely delivery of units, personnel, and materiel will lie with a single distribution manager at each echelon of support. By merging the materiel management (arming, fueling, fixing, sustaining, and manning) and movements management functions under a single manager, BD provides the support operations officer the capability to provide timely support and anticipate future requirements.[61]

The establishment of distribution management centers (DMC) at each echelon of support will facilitate the implementation of BD. The function of the DMC is to synchronize the various aspects of distribution operations. The DMC is critical to BD success and will perform such functions as merging of materiel and movement management functions into one centrally controlled location, providing staff supervision of the materiel management center and movement control center, providing priorities of work to support distribution operations, maintaining liaison with personnel service support (PSS) and medical logistics organizations to ensure synchronization of the flow of personnel, mail, and medical supplies within the distribution pipeline, supervising

execution of logistics operations, and act as the overall manager of BD within a given area of responsibility.[62]

The corps, division, and support battalion DMC will provide the link from the operational to the tactical distribution functions. The corps DMC, through the use of AIS/AIT and enhanced communications, will merge the managers and coordinators performing unit movement, medical, maintenance, personnel services support and all classes of supply into one single cell. The DMC will maintain "visibility of, and coordination for, units, personnel, unit equipment and sustainment materiel in the pipeline."[63]

The division DMC, like the corps, will be the single focal point for all distribution operations within the division. The support operations section of the S2/3 section of the DISCOM, and the medical materiel management branch of the DMOC will be merged at the DMMC. The division materiel management officer (DMMO) then becomes the support operations officer and division distribution management officer. The support battalion support operations section performs the distribution management functions within its area of responsibility. Both the DMMC and the support battalion will accomplish their distribution functions with the aide of AIS/AIT and communications enhancements.[64]

Along with the establishment of the DMC, BD will utilize the hub-and-spoke system to increase the overall system's efficiency. The distribution terminal is the "hub" of the hub-and-spoke and will receive, store, distribute , and redistribute unit equipment and sustainment materiel to appropriate supply support activities (SSA), the "spokes."

By establishing the distribution terminal as the central distribution activity and centralizing distribution management at each echelon of support with visibility of the entire AO, the BD concept will improve the distribution system's overall performance.

Consolidation of distribution functions within the support battalions will also be part of the BD structural changes. The movement of the class IX, repair parts section, of the maintenance company to the supply company in the support battalions will consolidate the materiel distribution at the division and brigade level.[65]

The establishment of the distribution terminal and the centralization of the management functions establishes the foundation for the procedural changes. The procedural changes of BD are centered around a fundamental change in distribution philosophy. Unlike the current system, BD is based on a pull distribution system. By integrating existing and new technologies BD will have the capability to provide sustainment materiel based on the OPTEMPO. The technologies will provide BD with the ability to fill requests within a 24 to 72 hours window.[66]

The current system, aligned along functional STAMISs with multiple management functions and distribution activities at each echelon, processes materiel from the A/SPOD directly to multiple SSAs. This process has proven to be inefficient to clearing ports and controlling the flow of materiel. BD will streamline the process by using the distribution terminal and centralized management centers. The conceptual flow of materiel under BD will be as follows.

> Unit materiel and equipment may be shipped through the distribution terminal to the owning unit as they arrive in theater ... Sustainment materiel designated for stockage will normally bypass the distribution terminal to the designated storage site. The supply accounting information is processed into the information system by the receiving

> storage site. Sustainment materiel, packaged for a single customer, will be received, processed, and throughput directly to the customer. Sustainment materiel is shipped, whenever possible, directly from the distribution terminal to the lowest SSA that serves the customer. ... The velocity of materiel to the requester increases, supplanting the requirement for maintaining redundant items on the authorized stockage lists (ASL) in the division and non-division SSAs.[67]

In order for the structural and procedural changes to be successful, BD will "require a single integrated STAMIS to perform distribution management."[68]

The information flow supporting the flow of materiel will be timely and accurate at every echelon of support. The information architect will be supported by enhanced communications systems, STAMIS, automated information systems and automated identification technology (AIS/AIT), and the Movement Tracking System (MTS).[69] Appendix A provides a discussion on the new technologies.

The communications enablers supporting BD will use the Army Common User Communications System of mobile subscriber equipment/tri-service tactical communication system/military satellite (MSE/TRI-TAC/MILSAT) for echelons supported by those systems. Within the division, at the BSA level, wireless communications such as the single channel ground and airborne radio system (SINCGARS), enhanced position location reporting system (EPLRS), and small unit packet radio will be employed to support the flow of information between the STAMIS. In order to maintain total asset visibility internal and external data transmission must be available. The Army Battle Command Systems (ABCS)[70] will support the internal communications while the use of hard-line host nation and tactical satellite will support the external communications. The objective is to provide "on-line, interactive

processing" through the use of enhanced communications.[71]

The STAMIS portion of the BD architect will rely on current and next generation systems. "The STAMIS are the heart of the logistics management capability on the battlefield. They include SARSS, SAAS, DAMMS-R, SAMS, ULLS, PWIS-3 [prisoner of war information system], MTS, and MEDSUP."[72] A "CSS automated information systems interface (CAISI) concentrator" will be located at each DMC to provide a central information location for distribution managers.[73]

By integrating the information and communications technologies into a reengineered distribution system, consisting of changes in structure (centralized management centers and consolidated distribution functions) and processes (streamline the flow of information and materiel), the BD concept addresses the deficiencies noted in the current system. The preceding discussion has shown that conceptually the battlefield distribution initiative is designed to improve the current system by implementing structural and procedural changes in order to develop a fully integrated distribution system.

IV. Analysis of the Battlefield Distribution Concept

The fundamental problem with the current distribution system is the lack of responsiveness. The RAND study identified four categories of problems which are the source of the current lack of system confidence. The four categories are structural issues, user behavior, unresponsiveness to change, and low standards.

The research questions will be answered by conducting a comparative analysis of the current system to the proposed BD system. The analysis will also compare the evolving concept with successful current and evolving distribution concepts in civilian industry. By looking at the deficiencies in the current tactical distribution system and comparing them to the BD concepts which parallel successful industry concepts the analysis will support or refute the theoretical basis of the BD concept as a holistic approach to solving the current distribution problems.

The theoretical basis for the BD concept lies in civilian industry. The BD concept of improving overall system performance by streamlining processes and centralizing management functions through the integration of new technologies is rooted in manufacturing industry systems theory. Though concepts such as "Just-in-Time" (JIT), "Non-Stop Logistics," "Continuous Flow Distribution," and "Efficient Consumer Response" can not directly be applied to the army's system, the theoretical basis of these concepts can be applied. Each of these concepts has a common theoretical basis; the provision of the required resources, at the required time, at the required location, and in the required quantity at least cost (cost is measured both in terms time and money).

The changes which are taking place within civilian industry distribution systems are primarily along organizational and technological lines. Industry is beginning to merge these two spheres in order to improve their distribution system performance. While the scope of this monograph does not allow for an in-depth discussion within these spheres, it will focus on the broad concepts in order to establish a basis of analysis of the BD concept.

Tompkins Associates Incorporation, a manufacturing and warehousing consulting business, has noted a trend in modern manufacturing. "Progressive companies are adapting to the changing environment by facilitating programs and processes designed to accommodate the paradigm switch from 'push' to 'pull' distribution. ... manufacturers and distributors are in various stages of transformation from 'push' to 'pull' distribution; however, ... more companies are focusing on supply chain issues and investing in logistics and distribution systems to meet customer and finical demands."[74] In his book *Managing for the Future, The 1990s and Beyond*, Peter Drucker discusses four principles and practices which are supporting the "emerging theory of manufacturing" and will be the essence of the factory of 1999. Statistical Quality Control, new manufacturing accounting, the "flotilla," or module, organization, and the systems approach are the "four principles and practices that [will] constitute a new approach to manufacturing."[75] "Statistical Quality Control is changing the social organization of the factory. The new manufacturing accounting lets [managers] make production decision as business decisions. The "flotilla," or module, organization of the manufacturing process promises to combine the advantages of standardization and flexibility. Finally, the systems

approach embeds the physical process of making things ..."[76] Of these four principles and practices, only the "flotilla," or module, organization and the systems approach have a direct application to the army's distribution processes.

The emergence of the flotilla organization has been a result of companies unsuccessfully trying to standardize at the cost of flexibility. In order to have both standardization and flexibility, at a low cost, the factory of 1999 will need to change its structure. "The plant of 1999 will be a "flotilla," consisting of modules centered ... around closely related operations. Though overall command and control will still exist, each module will have its own command and control. And each, like the ships in a flotilla, will be maneuverable, both in terms of its position in the entire process and its relationship to other modules. This organization will give each module the benefits of standardization and, at the same time, give the whole process greater flexibility."[77]

In addition to the physical changes in structure, the factory of the 1990s requires different communications and information. The module organization requires an information network which breaks the stovepiped information flow of old plants. "In the factory of 1999, sectors and departments will have to think through what information they owe to whom and what information they need from whom. A good deal of information will flow sideways and across department lines, not upstairs. The factory of 1999 will be an information network."[78] As a result of this change of information flow, Drucker contends that managers will have to be "mindful of the performance of the whole" system.[79]

The systems approach is the other Drucker principle of emerging manufacturing theory which has direct application to the army. The "new manufacturing" model is not "controlled," its parts are independent. The plant is not in the center. It is "little more than a wide place in the stream."[80] Companies are beginning to start their planning and scheduling from the customer at one end and look back to the independent supplier at the other end. This systems perspective has highlighted the importance of the distribution process throughout the system. New inventory management techniques are forcing many U.S. companies into a systems design. Manufacturers plan their inventory and product distribution by starting with customer requirements. Their distribution is then planned to keep inventory and transportation costs to a minimum by delivering just as the resource or product is required.

Technological revolutions are also having an impact on the way industries are organizing and conducting distribution operations. Information and communications systems are being integrated into the distribution process and allowing industries to reduce management levels and operating costs. Electronic data interchange (EDI)[81], automatic identification technology (AIT), wireless communications, and others have transformed the way industries organize and conduct their distribution operations.

By integrating information systems with management systems companies are able to transform their distribution operations to models of efficiency. Information and management systems integration has shown a positive relationship to responsiveness of companies. In their research findings, Daugherty, Ellinger, and Rogers concluded that "[i]information availability and responsiveness are positively related. Further,

responsiveness was found to be associated with better operating performance."[82] They also concluded that companies which were able to use information technologies were able to gain efficiencies in their operations. "The research indicates that responsive firms have leveraged information to improve operating performance. Customer responsive firms have been more successful in increasing efficiencies."[83]

The reorganization of distribution functions along emerging manufacturing theory and the integration of technologies with the distribution systems, through the melding of information and management systems, provides distribution managers real-time information in order to provide responsive deliveries to increasingly satisfied customers. However, implementing the tangible changes "is the easy part." Changing the intangible factor of "rational behavior" is the difficult part. In his article *Delivering the Goods*, Ronald Henkoff offers three key items to "untangle your supply-chain." Henkoff states managers must "recognize distribution as a process that transcends departmental, corporate, and even national boundaries; [understand] it's often cheaper to close warehouses and centralize distribution, even if it means paying higher freight bills; and, *forging electronic links with customers and suppliers is helpful, but technology is the easy part. Changing ingrained behavior is harder.* (emphasis added by author)"[84] Henkoff's last point is the key to effecting any organizational change.

The changes in management philosophies, organizational structures, and information flow within civilian industry are having positive results on responsiveness and customer satisfaction. The trend of the 1990s for improving industry-wide efficiency is to improve the efficiency of the distribution system. Current trends indicate that these

concepts are proving successful. Battlefield distribution is based on many of the same concepts being applied in civilian industry. At the theoretical level the battlefield distribution concept should realize the same successes.

The BD concept is the army's attempt to improve user confidence in the distribution system. In response to the first subordinate research question, whether or not the concept is oriented toward solving the identified problems, the BD concept is deficient in two of the four RAND categories. Of the four problem categories defined by the RAND study the BD concept directly addresses "structural issues" and "unresponsiveness to change" and is deficient in addressing "user behavior" and "low standards."

The organizational changes of BD (centralization and consolidation) directly attack and correct the structural issues and the unresponsiveness to change problem categories. The formulation of the distribution management center (DMC) at each echelon of support, the establishment of the hub-and-spoke distribution terminal, and the consolidation of supply functions at the support battalion will "defragment" the current distribution system. BD is emulating the industry structural model by centralizing the materiel management centers, the movement control functions, and the support operations activities at the DMC in each echelon of support. Based on current successful practices in the manufacturing industry and the fact that BD is copying those practices, the BD concept will alleviate the identified structural deficiencies of the current system.

The other problem area that BD has a direct positive impact is the current system's "unresponsiveness to change." The RAND study postulated that one of the

contributing factors which has a negative impact on the current system is that it is not keeping pace with the changes in operating costs which allow for more efficient operations. In essence the study is referring to the fact that the current system is operating on outdated practices. The BD concept is designed to change those outdated practices. The concept is built on the fact that efficiencies can be gained by using information and communication technologies and new organizational structures. The DMC and the hub-and-spoke distribution terminal are BD's response to the "unresponsiveness" deficiency.

The hub-and-spoke terminal will be a single centralized activity which is capable of maintaining visibility throughout an area of operations and has the capability to direct and redirect materiel directly to an SSA, DSU, or the ultimate user. This concept of removing redundant warehousing and distribution centers and increasing reliance on throughput operations is proving successful in civilian industry. BD will follow the same path of success by improving current STAMISs and integrating new technologies within new organizational structures such as the distribution management center and the hub-and-spoke terminal.

The organizational changes of the BD concept directly address two of the identified deficiencies and are aligned with current successful trends in civilian industry. However, BD does not directly address the user behavior and low standards deficiencies of the current system. The theoretical basis of BD is to remove the need to put large stocks of supplies forward in an AO based on BD's ability to rapidly move the required supplies when needed. The use of a hub-and-spoke terminal and the reliance on more

throughput will reduce the need to stock forward. BD's concept will allow brigade and division level units to "fight lighter" because their stocks will be moved forward rapidly when required.

BD's attempt to use this "pull" philosophy in the high friction environment of war will create a *confidence paradox*. Users' confidence in the distribution system's capabilities will increase because they will see that BD has the capability to react to needs rapidly. However, this increase in system confidence will not override fundamental human behavior to act rationally. Users will continue to stockpile supplies.

Commanders understand the nature of war and how chance and friction impact on plans and the conduct of battles. Due to this realization commanders will demand to have as much at hand as possible regardless of how efficient the distribution system is. Though Senge's "beer game" ties behavior to system confidence, the model is based on a system operating in a benign environment. Ronald Henkoff's conclusion of "technology is the easy part. Changing ingrained behavior is harder"[85] is more relevant and made more difficult because the army's system is operating in a hostile environment. BD may increase user confidence based on its proven theoretical capabilities, but rational human behavior will create a paradox which will continue to place additional burdens on the system regardless of its efficiency.

The other area where BD is deficient is addressing the low standards of the current system.[86] The measures of effectiveness of the current system are based on outdated practices and technologies. The standard of seven days for a high priority requisition to be delivered to the user from the time of requisition to actual delivery has

stood since 1974.[87] BD does address the capability to deliver within a 24 to 72 hours period from the time the requisition is received. However, it does not formally address changing the current standards by which the new capabilities can be measured. BD does have the ability to improve system performance and the concept should directly state that the capabilities will allow for increasing in the UMMIPS standards.

The second subordinate research question, what are the interrelationships of the six tactical sustainment functions, is important in order to maintain a systems perspective when changing the current system. The BD concept identifies that interrelationships exist and provides a solution to improving the interrelationships. The interrelationships of the six tactical sustainment functions lie with the management centers (movement and materiel) and the information and communications systems (current and proposed). The BD concept's solution to improving these interrelationships is to use improved STAMIS and evolving technologies at centralized management centers and to continue to evolve toward a single STAMIS for all six functions. Though the technology is still evolving, and BD will rely on the DMC manager to use his swivel chair to move between the STAMISs (known as "swivel-chair technology"), the concept does acknowledge the interrelationships between the six tactical sustainment functions and is being developed with a holistic approach.[88]

In response to the third research question, does information technology provide leverage in the BD system, the research indicates the answer to be yes. The essence of this question is whether information technology will make the distribution system more responsive. In practice, industry distribution models which have integrated information

technologies have shown to be successful and have become more efficient. A major portion of the distribution system relies on the information-communications link. By designing the system around the integration of AIS/AIT and enhanced communications systems BD will gain efficiencies and increase the systems responsiveness. Civilian industry models support the importance of using technologies to gain efficiencies. The key to gaining efficiencies in the information-communications portion is to use emerging technology, the BD concept understands this and is relying on it.

The final subordinate research question asked if there are successful civilian industry models which support the BD concept. The research indicates that there are models which are proving successful in the civilian sector and that the BD concept is in fact emulating those models. The theoretical basis of the civilian models is to streamline operations by centralizing distribution management functions, consolidating distribution activities, and increasing the effectiveness and efficiency of the overall system by integrating new technologies. BD has been developed on the same theoretical foundation and, in theory, should prove successful.

In response to the primary question, will the battlefield distribution (BD) concept, as developed by the Combined Arms Support Command, be capable of integrating the six tactical sustainment functions to form a more responsive distribution system, the answer is not definitive. The research indicates that the BD concept is using a holistic approach by integrating the six sustainment functions through centralizing management functions and consolidating distribution activities. However, the research also indicates that the responsiveness of the system my be hindered by system overload based on a *confidence*

paradox. Overcoming rational human behavior is and will always be a formidable challenge for the army distribution system.

V. Conclusions and Recommendations.

The purpose of this monograph was to determine if the Battlefield Distribution concept is being developed with a true systems perspective. Subsequent purposes were to educate the reader on an emerging concept and to add to the debate of applying emerging technologies to alleviate identified shortcomings. The scope of the monograph was limited to the tactical level of war and the research concentrated on the six tactical sustainment functions within the corps, division, and brigade organizations. Subsequent research included identifying civilian theoretical models which are proving successful and have application to the battlefield distribution concept.

The objective of the concept is to improve the shortfalls of the current system in order to increase customer confidence in the distribution system. The lack of system confidence is a function of four problem categories in the current system; structural issues, user behavior, unresponsiveness to change, and low standards. The research indicates that the concept does address each of the categories to some degree.

BD will alleviate the structural issues by "defragmenting" the current distribution system. BD also shows that the army's distribution system has become more responsive to change by looking to civilian markets as models of improving efficiencies in the system. While BD directly addresses the structural and responsiveness issues it does not fare as well with the behavioral and standards categories.

BD's philosophy of relying on an efficient operating system to improve customer confidence creates a *confidence paradox*. Historically, fundamental human behavior has dominated any attempts to improve the system. While users may see that the system is

more efficient, they also understand the realities of war. Rational behavior will drive the user to continue to place additional burdens on the system to ensure that they are not caught short, regardless of how efficient the system operates.

Finally, the research has shown that while the BD concept does mention the ability to provide resources within a 72 hours window it does not directly address the need to improve the standards as a way to formally measure its performance. While this is not directly addressed in the concept it is a reality which is being addressed in other initiatives.

The BD concept is founded on sound and successful theoretical principles. BD is integrating the six tactical sustainment at each echelon of support. The integration is being facilitated with the merging of current and emerging technologies with the functionally aligned management activities. The concept is removing redundant distribution functions by creating centralized distribution activities, like the hub-and-spoke distribution terminal. The structural and procedural changes envisioned by the concept will make the army's distribution system more responsive and should increase system confidence.

The following recommendations are submitted for future study and for consideration in the evolving concept.

What impact will the increase in speed and quantity of information flow have on the limited transportation and MHE assets? BD is a concept which is centered on integrating technologies to improve the speed at which information can flow thereby reducing the processing time and shortening the OST. While it is implied that the

concept will have total visibility of all resources, to include availability of transportation and MHE, the question must still be asked if there will be sufficient assets to support the increased flow of materiel which will result from greater access to the requirements. Transportation and MHE have always been one of the limiting factors of the distribution system and creating a system without serious consideration of these constraints may prove disastrous in the future.

The second consideration for farther study deals with force structure. Can the logistics community lead the way in savings gained through a more efficient distribution system? The army has again found itself trying to balance force sustainment and force modernization. By looking to the logistics function as one sub-system which transcends all functions of the army's life cycle model, the army may be able to shift funds to future investments without degrading combat readiness. BD is based on civilian models which are improving their logistics operations in order to reduce overall costs. Current literature is showing that these models are proving successful. By investigating and implementing appropriate industry changes in distribution management the army will realize savings in a sub-system which transcends all major functions of the army's life cycle model.

Appendix A. New Technologies

This section is a summary of the CASCOM Pamphlet, Battlefield Distribution, *Appendix C, Technology*, 25 September 1995.

Automatic Information Technology (AIT) encompasses a family of hardware and software systems designed to gather, store, and pass information. Radio frequency (RF) technology, LASER/Memory cards, Logistics Marking and Reading System (LOGMARS), and 2-dimensional bar-coding will support the BD concept. However, the primary technology will be RF.

RF technology includes radio frequency identification (RFID) and radio frequency data communications (RF/DC). These technologies are omni-directional, read/write RF capable of maintaining in-transit visibility reporting, conducting source data automation (a process used to provide data about an item to an inventory manager in order to sort, consolidate, move, redirect, or transfer stocks between supply and transportation activities), and locating and identifying major end items, intensely managed supply items, and the contents of containers. RFID and RF/DC uses the concept of radio wave transmission and reception to pass information about objects that need to be identified or tracked. The information is stored in a tag with media storage capability similar to a computer floppy disk. The amount of data that is carried on a tag can be tailored to the individual requirement. Current technology allows up to 128,000 characters of data to be available for read/write operations. Antennas or "interrogators" provide a remote "stand-off" read/write capability in order to read information contained

on the tag attached to an item. The information is then passed back to a central database. The remote tag reading range is approximately 1000 feet from the interrogator.

RF tags allow greater flexibility than the bar coding technology. The omni-directional radio wave propagation allows the tag to be read in "non-line of site" situations. Physical contact with the tag is not required; therefore, it is possible to read information off the tag while the item is moving which eliminates the need to stop the distribution process. RF tags also help when items are placed in physically inaccessible locations (e.g., inside stacked containers) and during hours of darkness.

The Automated Information Systems (AIS) is another family of technologies which will support the BD concept. AIS is an "integrated and interoperable" family of automated information systems that provide the required supply, transportation, and maintenance capabilities. The integrated combat service support system (ICS3) is the key to AIS. It is comprised of three integrated information systems modules; the supply module which is comprised of the SARSS, ULLS, SAAS, and SPBS-R, the transportation module which contains DAMMS-R, and the maintenance module which consists of the SAMS.

The final technology being employed by the BD concept is the movement tracking system (MTS). MTS consists of long range digital communications, global positioning systems (GPS), and the computer capability to track the location of vehicles and communicate with vehicle operators. MTS furnishes command and control to provide in-transit visibility of movements and the ability to redirect movements based on changing requirements. While AIT provides the ability to document arrival and

departure events at various nodes, MTS provides real time tracking and messaging between transportation managers and the vehicles actually moving resources.

MTS technology allows both the mode managers and the vehicle operators to graphically portray the location of the vehicle and message each other using software which ties everything together. The hardware includes a long range programmable communications device, a GPS device, a power supply, and computer equipment located both in the vehicle and with the transportation node manager. Position locations are received through the GPS and passed to the computer. The computer displays the location on the onboard screen then prepares a message to be passed to the communications device for subsequent forwarding to the mode manager. At the mode manager site, the manager has visibility of all assets under his control and can direct individual or groups of operators to fulfill requirements.

End Notes

[1] "Velocity management" is an evolving concept which refers to the use of information technologies to increase the speed at which management functions are performed. For further reading on this evolving concept see LTG Robinson's "Velocity Management: An initiative to Improve the Army Logistics System," Army Logistician, May-June 1995, 10-11.

[2] James Huston, Army Historical Series; The Sinews of War; Army Logistics 1775-1953, (Washington D.C.: Center of Military History United States Army, US Government Printing Office, 1966), 154.

[3] Ibid., 31-34.

[4] Ibid., 153.

[5] Ibid., 215-239.

[6] Joseph M. Heiser Jr. A Soldier Supporting Soldiers. Washington D.C.: Center for Military History United States Army, 1991, 287.

[7] Ibid., 289/90.

[8] Ibid., 297.

[9] Ibid.

[10] We can point to the current STAMIS systems as a success of Lt. Gen. Heiser's offensive. As the Deputy Chief of Staff for Logistics he was instrumental in establishing the foundation for the logistics automation systems which are supporting today's army.

[11] Field Manual 100-5, Operations, (Washington D.C.: Headquarters Department of the Army, 14 June 1993), 12-2.

[12] Ibid., 12-2.

[13] Ibid., 12-3.

[14] Student Text 63-1, Division and Corps Logistics, (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1 June 1994), chapters 2, 3, & 6 passim. The ammunition is moved on theater or corps vehicles. The CMCC retains visibility of the transportation resources and allocates those resources based on CMMC requirements. The CMMC interfaces with the DAO in order to approve stockage objectives, direct ammunition distribution within the corps, provide requirements for moving ammunition to the CMCC, and to coordinate with other agencies to fill ammunition requirements. The DAO, which is located in the DMMC, is responsible for ammunition distribution in the division. The DAO maintains continuous communications with the direct support units (DSU) in the support battalions, the support operations officer and the MCO in the DISCOM, and the DTO. The physical distribution of ammunition into the division, down to the DSU, is carried out by theater and corps vehicles. The distribution from the supply company of the DSU to the user is accomplished by user vehicles.

The same players that manage and control the arming function at the corps level manage and control the fueling function (the CMMC, the CMCC, and the COSCOM support operations officer). COSCOM transportation and petroleum units accomplish the physical distribution in the corps and down to

the division based on requirements received from the COSCOM support operations officer. The division level distribution is managed and controlled by the DMMC, the DISCOM support operations officer, and the DISCOM MCO. Theater and corps transportation platforms move the fuel to the support battalion's DSU's based on requirements received from the DISCOM support operations officer and DMMC. Using units then provide their own transportation for resupply from the supply company of the DSU.

The distribution of the field services and general supply support sub-functions of sustaining are aligned with the arming and fueling sustainment functions. Field services and general supply support are managed and controlled by the CMMC and DMMC. The MMCs coordinate with the CMCC, the DTO, and the DISCOM MCO to ensure transportation assets are available for distribution of the field services. The corps GS and DS and division DS units, in conjunction with the using unit, establish requirements and coordinate with the MMCs for priorities and distribution of supplies. The COSCOM and DISCOM support operations officer monitor and direct field services and general supply support.

[15] Ibid., chap. 4 passim. At the corps level the CMMC and the CMCC manage and control the flow of repair parts forward and the evacuation of equipment rearward. The CMMC and the COSCOM support operations officer manage the workload of the general support maintenance (GSM) and direct support maintenance (DSM) units in the COSCOM. The repair parts of the COSCOM are stocked at the repair parts supply company (GS) and the DSUs. Each activity is authorized to stock a certain number of line items in inventory. The repair parts supply company (GS) supports both COSCOM and division DSUs with replenishment of repair parts. The CMMC coordinates with the CMCC for transportation to distribute repair parts to the appropriate DSU.

The DMMC coordinates with the CMMC, the DISCOM support operations officer and MCO, and the DSUs to effect the distribution repair parts into the division and the evacuation of equipment out of the division. The repair parts flow into the light maintenance companies of the main support battalion (MSB). The MSB then transports repair parts to the maintenance companies of the forward support battalions (FSB). The DMMC manages and accounts for the repair parts inventory in the division.

[16] Ibid., 5-2 - 5-7.

[17] Ibid., 5-7/8.

[18] Ibid., 6-1. PSS includes the management and execution of personnel services, resource management, finance services, chaplaincy services, command information services, and legal support services. The personnel services activity includes the three manning function activities along with postal operations management, personnel information management, and replacement management.

[19] Ibid., 6-51.

[20] Ibid., 6-23, 6-26/27.

[21] Ibid., 6-20.

[22] Logistics Automation Directorate, Meeting the Need for CSS Information, (Fort Lee, VA: US Army Combined Arms Support Command, 6 April 1995), 10. SIDPERS is a stand alone system which supports both peacetime and wartime requirements.

[23] Ibid., 7 - 7.3.

[24] Ibid., 1 - 1.2.

[25] Ibid., 4 and 6.

[26] Ibid., 4.2.

[27] Ibid., 4 and 5.

[28] Ibid., 4.2, 4.3, 6.2, and 6.3.

[29] Ibid., 8.

[30] Ibid., 3.2 - 3.3.

[31] Ibid., 9 - 9.2.

[32] Army Regulation 725-50, Requisitioning, Receipt, and Issue System, (Washington D.C.: U.S. Government Printing Office, 26 January 1993), 33-34. "The FAD is a Roman numeral (I through V) which shows the mission essentially of a unit, organization, installation, project, or program to meet national objectives." (p. 33); The UND is determined by the requisitioning activity "and shows the need of materiel requisitioned to accomplish its assigned mission."(p. 34); "PDs are determined by the combination of the assigned FAD and the UND." For additional information on the UMMIPS see chapter 2, of the referenced AR.

[33] Ibid., 34. "The SDD is a maximum ending date by which normal processing and shipping will permit the consignee to receive and record the materiel."

[34] Ibid.

[35] John M. Halliday and Nancy Y. Moore, Materiel Distribution: Improving Support to Army Operations in Peace and War. RAND Corp., March 1994, downloaded from NETSCAPE http//rand.org/ 15 Aug 1995.

[36] Donald L. Hinton, "A Customer's Perspective on Army Materiel Distribution," Army Logistician, Jan-Feb 1995, 9.

[37] Halliday.

[38] Ibid.

[39] Peter Senge, etal. The Fifth Discipline Fieldbook, Strategies and Tools for Building a Learning Organization, (New York, NY: Doubleday, 1994), 27.

[40] Ibid.

[41] Halliday.

[42] Ibid.

[43] Ibid.

[44] Ibid.

[45] Hinton., 11.

[46] Halliday. My research has shown an inconsistent trend in the UMMIPS standards. The RAND study cites the 6 and 20 days standard for 1959. Reviewing AR 725-50 from 1967 through the present shows very

little change, and in fact reduced standards. Additionally, LTC Hinton, in his article cites another set of current standards which are different than the those already cited.

1965

	CONUS	OCONUS
PD 01 - 03	5 days	7 days
PD 04 - 08	8 days	15 days
PD 09 - 15	20 days	50 - 75 days

1974

	CONUS	OCONUS
PD 01 - 03	7 days	11 - 12 days
PD 04 - 08	11 days	15 - 16 days
PD 09 - 15	28 days	67 - 82 days

1986

	CONUS	OCONUS
PD 01 - 03	7 days	11 days
PD 04 - 08	11 days	15 - 16 days
PD 09 - 15	29 days	67 - 82 days

1993

	CONUS	OCONUS
PD 01 - 03	7 days	11- 12 days
PD 04 - 08	11 days	15 - 16 days
PD 09 - 15	29 days	67 - 82 days

[47] Ibid.

[48] Martin Van Creveld, Command in War, (Cambridge, MA: Harvard University Press, 1985), 185.

[49] Point Paper, USACASCOM, ATCL-CF, Subject: Communications Flow for Distribution, 30 August 1995.

[50] Ibid., i - ii. The VM initiative's aim "is to get logistics support into the hands of the soldier as fast has any first-rate commercial firm, while providing a hedge against unforeseen interruptions in the logistics pipeline, eliminating sources of delay and restoring dependability in the logistics processes." ASCC is an organizational concept which addresses a long recognized void in CSS operations. ASCC "will establish the required command and control structure ands its associated functions in a theater of operations." The final initiative, RSO&I is being developed to "ensure priority timeline deployment of CSS operators to establish critical logistics functions required to support the dynamics of force projection."

[51] Ibid.

[52] Ibid., iii & 1.

[53] Battlefield Distribution, U.S. Army Combined Arms Support Command Draft Concept, Fort Lee, VA. 2 December 1994, 3.

[54] USACASCOM Pamphlet, Battlefield Distribution, U.S. Army Combined Arms Support Command, Fort Lee, VA, 25 September 1995, 1.

[55] Ibid., 6.

[56] Ibid.

[57] Ibid., 7.

[58] Ibid.

[59] "Horizontal redistribution" refers to the redirecting of supplies from one supply activity to another within a certain echelon of support, as opposed to the normal flow from one echelon to nest.

[60] Ibid.

[61] Ibid.

[62] Ibid.

[63] Ibid.

[64] Ibid., 11.

[65] Ibid., 22.

[66] Ibid., 7.

[67] Ibid., 14.

[68] Ibid., 9

[69] Ibid., 15.

[70] The Army Battle Command System (ABCS) is composed of hardware and software used to manage the flow of voice and data information. The ABCS includes a family of systems such as the combat service support command system (CSSCS).

[71] Ibid., C-12.

[72] Ibid., 13.

[73] Information Paper, ATCL-CF, Subject: Communications Flow for Distribution, 30 August 1995.

[74] Tompkins Associated Incorporated, "Continuous Flow Distribution," Monograph Series No. M0017, Raleigh, N.C. Tompkins Associates Incorporated, 1995, 1.

[75] Peter F. Drucker, Managing for the Future, The 1990s and Beyond, (New York, NY: Truman Talley Books/Dutton, 1992), 301.

[76] Ibid., 201/2.

[77] Ibid., 310.

[78] Ibid., 312.

[79] Ibid.

[80] Ibid., 313.

[81] EDI- refers to a technology used to exchange information and data across organizations.

[82] Patricia J. Daugherty, Alexander E. Ellinger, and Dale S. Rogers, "Information Accessibility, Customer Response and Enhanced Performance," International Journal of Physical Distribution & Logistics Management, Vol. 25, No. 1, 1995, 15.

[83] Ibid.

[84] Ibid., 76.

[85] Ronald Henkoff, "Delivering the Goods," Fortune, November 28, 1994, 76.

[86] This deficiency was identified early in my research. Since that time CASCOM as developed a new initiative called Velocity Management (VM). The VM initiative is being developed to address all the procedural issues of the army's logistics system. The UMMIPS standards will be addressed in the VM initiative. Per telephone conversation with LTC Wardlaw, USACASCOM, 9 November 1995.

[87] See end note 41.

[88] LTC Wardlaw, Team Chief, Battlefield Distribution Task Force, USACASCOM, 9 November 1995 in telephone conversation with the author. LTC Wardlaw used this term in discussing the DMCs. Until the new single STAMIS and integrated communications systems are available the DMC managers will retain total visibility by monitoring the various STAMIS in a single location by moving and spinning in their swivel chair

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